
Understanding hESC-based Hematopoiesis for Therapeutic Benefit

Grant Award Details

Understanding hESC-based Hematopoiesis for Therapeutic Benefit

Grant Type: Comprehensive Grant

Grant Number: RC1-00347

Investigator:

Name: Andrew Leavitt
Institution: University of California, San Francisco
Type: PI

Human Stem Cell Use: Embryonic Stem Cell

Award Value: \$2,460,822

Status: Closed

Progress Reports

Reporting Period: Year 2

[View Report](#)

Reporting Period: Year 3

[View Report](#)

Reporting Period: Year 4

[View Report](#)

Grant Application Details

Application Title: Understanding hESC-based Hematopoiesis for Therapeutic Benefit

Public Abstract:

Hematopoietic stem cell transplantation is the treatment of choice for many hematologic malignancies, and it is used to treat an expanding number of congenital blood disorders. However, only ~30% of patients who can benefit from this treatment have a matched sibling that can serve as the ideal donor. While the national marrow donor program and umbilical cord blood programs provide unrelated donor cells to many patients lacking a sibling donor, a large percentage of patients remain without a suitable donor, leaving them with suboptimal therapeutic options. This problem is more severe in certain ethnic populations, including people of Latino and Asian descent, groups that constitute a large part of California's population. New sources of therapeutic hematopoietic stem cells are therefore needed.

Human embryonic stem cells, with their unlimited self-renewal capacity and their ability to generate all human cell types, provide a novel and exciting opportunity to obtain hematopoietic stem cells, thereby filling a critical therapeutic void. However, many hurdles remain before this vision can be realized, including the identification of more optimal human embryonic stem cell lines and better methods to direct the development of specific cell types from embryonic stem cells.

This proposal seeks to shed new insight into how we might better control and direct the development of human embryonic stem cells into therapeutically useful hematopoietic stem cells that can be used for transplantation. Our effort focuses on understanding how a specific class of small RNAs, called microRNAs, regulates the differentiation of human embryonic stem cells into specific cell types. We aim to uncover the identity of microRNAs that are important for this process, which will serve as useful biomarkers, or guides, for evaluating the therapeutic suitability of existing and newly derived human embryonic stem cell lines. In addition, we will develop techniques and reagents to modulate the expression of these critical small molecules to help direct human embryonic stem cell development for clinical therapeutic utility.

Statement of Benefit to California:

This proposal seeks to understand how small RNA molecules help direct the differentiation of human embryonic stem cells into specific cell types suitable for therapeutic use. Our focus is the development of hematopoietic stem cells for the treatment of blood disorders. Benefits to the State of California include:

A new source of hematopoietic stem cells for patients who lack a matched donor. Some ethnic groups, such as people of Latino and Asian descent, are more likely to lack a donor, so those groups may benefit the most.

Hematopoietic stem cells have been shown to have the potential to participate in the repair of a wide range of tissues, including heart tissue, so human embryonic stem cell-generated hematopoietic cells may be useful in treating disorders outside of the blood system per se. We will develop databases and technologies that could have wide-ranging use in the human stem cell field. To the extent that these can be commercialized, the work could be of financial benefit to California.

The kind of work proposed could attract additional economic interests to the state of California because our methods and reagents could be used by California businesses aimed at treating those afflicted with blood disease.

This work will provide new jobs for the University of California, San Francisco, and hopefully spawn additional research in the California academic and private sectors.

The proposed research is cutting-edge, and successful accomplishment of our goals would help put California at the forefront of human embryonic stem cell research, rewarding Californians for their support of proposition-71, and inspiring others to support human embryonic stem cell research.